

November 27, 1890.

Mr. JOHN EVANS, D.C.L., Treasurer and Vice-President, in the Chair.

In pursuance of the Statutes, notice of the ensuing Anniversary Meeting was given from the Chair, and the list of Officers and Council nominated for election was read as follows:—

President.—Sir William Thomson, D.C.L., LL.D.

Treasurer.—John Evans, D.C.L., LL.D.

Secretaries.— { Professor Michael Foster, M.A., M.D.
 { The Lord Rayleigh, M.A., D.C.L.

Foreign Secretary.—Archibald Geikie, LL.D.

Other Members of the Council.—Professor William Edward Ayrton; William Henry Mahoney Christie, M.A.; Professor W. Boyd Dawkins, M.A.; James Whitbread Lee Glaisher, D.Sc.; Hugo Müller, Ph.D.; Professor Alfred Newton, M.A.; Sir William Roberts, M.D.; William Chandler Roberts-Austen, F.C.S.; Professor Edward Albert Schäfer, M.R.C.S.; Sir George Gabriel Stokes, Bart., M.A.; Lieut.-General Richard Strachey, R.E.; Professor Joseph John Thomson, M.A.; Professor Thomas Edward Thorpe, B.Sc.; Sir William Turner, M.D.; Professor Sydney Howard Vines, M.A.; General James Thomas Walker, C.B.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "On the Homology between Genital Ducts and Nephridia in the Oligochaeta." By FRANK E. BEDDARD, M.A., Prosector of the Zoological Society. Communicated by Professor E. RAY LANKESTER, M.A., LL.D., F.R.S. Received October 10, 1890.

It is usually stated in text books that the genital ducts of the Oligochaeta are homologous with nephridia; but nevertheless the question is one which has not yet been satisfactorily settled, for the

total independence of the two structures in *Lumbricus* and those aquatic Oligochæta of which the development is known is a difficulty in the way of accepting this view. Claparède, who first clearly formulated the arguments in favour of regarding the genital ducts as slightly modified nephridia, made a mistake in stating that the genital segments of the aquatic Oligochæta contain no nephridia; this error was pointed out by Vejdvský* who discovered that the genital segments are originally furnished with nephridia, which atrophy on the ripening of the sexual products and the appearance of their ducts. Professor Lankester pointed out that in *Lumbricus*† the genital ducts and the nephridia have a close relation to one or other of the two pairs of setæ with which each segment is provided. He suggested that the genital ducts might represent the only portion left of a ventrally opening series of nephridia. M. Perrier's memorable investigations‡ into the structure of exotic Earthworms tended at first to confirm this theory. He discovered that in one Earthworm (*Plutellus*) the nephridia alternated in position from segment to segment, thus suggesting that the supposed original two sets of nephridia had both partly persisted and partly disappeared. In other forms the nephridia were found to be related to the ventral setæ, and the genital apertures to the dorsal setæ, the exact converse of the condition which occurs in *Lumbricus*. Later investigations, however, which resulted in the discovery that the genital apertures and nephridiopores may coincide at the same seta, led M. Perrier to abandon the hypothesis. My own discovery, first published in the Proceedings of this Society,§ that in *Acanthodrilus multiporus* there are more than a single pair of nephridiopores to each segment, removed the difficulties urged by Perrier. And as this discovery has been extended by myself and by others to many species and genera of Earthworms, there can be no longer any intrinsic improbability in the hypothesis. The whole subject has been lately reviewed by Eisig in his treatise upon the Anatomy and Physiology of the Capitellidæ, which forms one of the series of monographs issued by the Zoological Station at Naples. Dr. Eisig decides that the genital ducts are probably modified nephridia in the Oligochæta; in the Capitellidæ they certainly are; but, as the Capitellidæ do not appear to me to be so nearly related to the Oligochæta as Dr. Eisig considers, I should regard this argument as only having the force that an argument from analogy can have. Since the appearance of Dr. Eisig's work, an important paper by Dr. Stolic|| dealing with the generative organs

* 'System u. Morph. d. Oligochäten,' Prag, 1884.

† 'Quart. Journ. Microsc. Sci.,' 1864-5.

‡ 'Nouv. Arch. du Muséum,' vol. 8 (1872).

§ 'Roy. Soc. Proc.,' vol. 38, 1885, p. 459.

|| 'Böhm. Gesell. Sitzber.,' 1889.

of *Æolosoma* has come into my hands; it appears that in this Annelid there are no special sperm ducts, but that the function of such ducts is performed by several pairs of nephridia. This fact, however, interesting though it is, is not a proof of the homology between sperm ducts and nephridia in other types.

I have lately had the opportunity of studying the development of the New Zealand species *Acanthodrilus multiporus*. The sum of money which the Government Grant Committee of the Royal Society were good enough to place at my disposal has enabled me to defray the expenses of this investigation.

In the young embryos of this worm each segment is furnished with a pair of nephridia, each opening by a ciliated funnel into the segment in front of that which carries the dorsally placed external pore. In later stages the funnels degenerate, and that portion of the tube which immediately follows the funnel becomes solid, losing its lumen; at the same time the nephridium branches, and communicates with the exterior by numerous pores. At a comparatively early stage, four pairs of gonads are developed in segments X—XIII; each of these is situated on the posterior wall of its segment, as in *Acanthodrilus annectens*, and not on the anterior wall, as in the majority of Earthworms. When the gonads first appear, the nephridial funnels, with which they are in close contact, are still ciliated, and their lumen is prolonged into the nephridium for a short distance. Later the cilia are lost, and the funnels increase greatly in size, while those of neighbouring segments—in fact, all the remaining funnels—remain stationary for a time, and then become more and more degenerate. The large funnels of the genital segments become the funnels of the vasa deferentia and oviducts; it will be observed that the number of ovaries and oviducal funnels (*two* pairs) at first corresponds to that of the testes and sperm duct funnels; subsequently the gonads and commencing oviducts of segment XII atrophy. Each of these large funnels is continued into a solid rod which passes back through the septum, and then becomes continuous with a coiled tuft of tubules, in which there is an evident lumen, and which is a part of the nephridium of its segment. In the segments in front of and behind the genital segments, the rudimentary funnels communicate in the same way with a solid rod of cells which runs straight for a short distance and then becomes coiled and twisted upon itself and provided with a distinct lumen. In fact, apart from the relative size of the funnels and the presence of the gonads, it would be impossible to state from which segment a given section through the terminal portion of a nephridium had been taken. In a later stage the large funnels of the genital segments become ciliated; but this ciliation takes place before there is any marked change in the tube which is connected with the funnel.

In the young worm which has just escaped from the cocoon, the funnels are ciliated, and they are each of them connected by a short tube, in which a lumen has been developed, but which ends blindly in close proximity to a coil of nephridia. No trace of any nephridial tube other than the sperm duct or oviduct could be observed, whereas, in the preceding and succeeding segments the rudimentary nephridial funnel and a straight tube leading from it direct to the body wall were perfectly plain. Dr. Bergh* has figured, in his account of the development of the generative organs of *Lumbricus*, a nephridial funnel in close contact with the funnel of the genital duct. It may be suggested that a corresponding funnel has been overlooked in the embryo *Acanthodrilus*; the continuity of a structure, identical (at first) with the nephridia of the segments in front and behind, with the genital funnels, seems to show that a search for an additional nephridial funnel would be fruitless.

I can only explain these facts by the supposition that in *Acanthodrilus multiporus* the genital funnels and a portion at least of the ducts are formed out of nephridia. This mode of development is a confirmation, to me unexpected, of Balfour's suggestion† that in the Oligochaeta the nephridium is broken up into a genital and an excretory portion.

In the comparison of the facts, briefly described here, with the apparently independent origin of the generative ducts in other Oligochaeta, it must be borne in mind that in *Acanthodrilus* the segregation of the nephridium into several almost detached tracts communicating with the exterior by their own ducts precedes the formation of the genital ducts.

II. "The Patterns in Thumb and Finger Marks: on their Arrangement into naturally distinct Classes, the Permanence of the Papillary Ridges that make them, and the Resemblance of their Classes to ordinary Genera." By FRANCIS GALTON, F.R.S. Received November 3, 1890.

(Abstract.)

The memoir describes the results of a recent inquiry into the patterns formed by the papillary ridges upon the bulbs of the thumbs and fingers of different persons. The points especially dwelt upon in it are the natural classification of the patterns, their permanence throughout life, and the apt confirmation they afford of the opinion that the genera of plants and animals may be isolated from one another otherwise than through the influence of natural selection.

* 'Zeitschr. Wiss. Zool.,' 1886.

† 'Compar. Embryol.,' vol 2, p. 617.